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| 10/774,099 | 02/06/2004 | Hung-Eil Kim | H1647 | 8365 |
| 45305 | 7590 | 11/13/2006 | EXAMINER | |
| RENNER, OTTO, BOISSELLE & SKLAR, LLP (AMDS) | | | RUGGLES, JOHN S | |
| 1621 EUCLID AVE - 19TH FLOOR | | | ART UNIT | |
| CLEVELAND, OH 44115-2191 | | | PAPER NUMBER | |

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| 1756 |
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DATE MAILED: 11/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/774,099

Applicant(s)

KIM, HUNG-EIL

Examiner

John Ruggles

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) none is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
- Paper No(s)/Mail Date _____.

- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

In the current submission filed on 8/31/06, claims 1-9 and 13 are currently amended, claims 10-12 remain as originally filed, and new claims 14-15 are currently added. All of these claims are under consideration.

Applicant's amendments to the specification are non-compliant and have not been entered, at least because the amended abstract is not presented on a separate sheet (37 CFR 1.72). Accordingly, the previous objections to the specification are maintained, as shown below.

The previous rejections of the claims under the second paragraph of 35 USC 112 are revised below, as necessitated by the current amendment.

The previous prior art rejections of the claims have also been revised in response to the current amendment, as indicated below. Since the current amendment necessitated revision of the prior art rejections, these rejections are now made FINAL.

Specification

The abstract of the disclosure is objected to because it is not written in the proper language, which should be amended as follows: --A method of fabricating a photomask having a pellicle on a photomask substrate ~~is disclosed. The method that~~ facilitates accurate measurement of a critical dimension on the photomask ~~critical dimension~~, without requiring ~~[[the]]~~ removal of the pellicle from the photomask substrate. A first pattern is transferred onto ~~[[a]]~~ the photomask substrate in a first area~~[[,]]~~ and at least one test pattern is transferred onto the photomask substrate outside of the first area. ~~[[A]]~~ The pellicle is attached to the photomask substrate~~[[,]]~~

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~~and the pellicle~~ to cover[[s]] the first area, but does not cover the at least one test pattern.--.

Correction is required. See MPEP § 608.01(b).

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: (1) at page 1 line 7, "without removing a pellicle" should be changed to --without removing a pellicle from the mask--; (2) at page 1 line 20, "A pellicle is a thin (~1 um) polymer film" should be corrected to --[[A]] The pellicle is a thin (~1 [[um]] um) polymer film-- (in which the unit --um-- represents "micrometer"); (3) at page 2 line 4, "the electron beam and other machines" should be changed (to e.g., --[[the]] an electron beam machine and other machines--, etc.); and (4) both at page 3 lines 15-16 and again at page 5 line 16, the phrase "similar in magnitude" is unclear as being vague and indefinite with regard to the scale or degree of similarity that was intended between the first mask pattern critical dimension (CD) and the test pattern CD, at both occurrences. Note that due to the number of errors, those listed here are merely examples of the corrections needed and do not represent an exhaustive list thereof.

Appropriate correction is required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-6 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1 line 4, again in lines 5-6, and also in claim 5 lines 1-4, the “projecting” steps are unclear, at least because this term implies copying of a pattern **from** a first location or object portion **onto** a second different location or object portion. In claim 1 line 4, “projecting a first pattern on a substrate in a first area” is unclear about whether the first pattern is being projected either **from** or **onto** the first area of the substrate and it is also unclear **onto** or **from** what other different object besides the first area of the substrate the first pattern is being projected.

However, for the purpose of this Office action, claim 1 line 4 has been interpreted to mean --projecting fabricating a first pattern on a substrate in a first area--. Similarly in claim 1 lines 5-6, “projecting at least one test pattern on the substrate outside of the first area” is also unclear and has been interpreted for the purpose of this Office action to mean --projecting fabricating at least one test pattern on the substrate outside of the first area--. Additionally in claim 5 lines 1-4, “wherein projecting the first pattern and projecting the at least one test pattern include projecting the first pattern and the at least one test pattern substantially simultaneously on the substrate” is unclear for similar reasons as well as because it is unclear whether “substantially simultaneously” means that these steps are performed (a) at the same time (in accordance with page 5 line 2 of the specification) or (b) are conducted so that they overlap in time. Nevertheless for the purpose of this Office action, this phrase has been interpreted to mean --wherein projecting the fabricating of the first pattern and projecting the fabricating of the at least one test

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pattern include ~~projecting~~ fabricating both the first pattern and the at least one test pattern ~~substantially simultaneously~~ on the substrate at the same time-- (in accordance with the original specification). It is also understood from the specification at page 5 line 29 to page 6 line 18 that these patterns are fabricated by forming an opaque layer on the substrate, patterning a resist thereon, then selectively etching by either a wet or dry etchant of the opaque layer through the resist pattern (as is conventionally known) to produce the first mask pattern and the at least one test pattern on the substrate. Claims 2-6 and 14 depend on claim 1.

In claim 2, the phrase "projecting at least one test pattern" is interpreted to mean -- ~~projecting~~ the fabricating of the at least one test pattern--, in order to clarify the antecedent basis for this phrase as interpreted above in claim 1 line 5 (on which claim 2 depends). Claims 3-4 depend on claim 2.

In claim 6 lines 2-4, the phrase "projecting the first pattern and projecting the at least one test pattern include forming the first pattern and the at least one test pattern under substantially the same conditions" is repetitive and unclear with regard to the extent or degree of similarity between the conditions under which the first pattern and those under which the at least one test pattern are formed on the photomask. For the purpose of this Office action, this phrase has been interpreted in accordance with the above interpretation of claim 1 lines 4-5 (on which claim 6 depends) and also in accordance with page 5 lines 2-3 of the original specification to mean -- ~~projecting~~ the fabricating of the first pattern and ~~projecting~~ the fabricating of the at least one test pattern ~~include forming the first pattern and the at least one test pattern occur~~ under substantially the same or similar conditions--.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1, 5-7, and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 2002/0102477).

Tanaka et al. teach masks and methods of making them (abstract, [0004]). In Figure 1 (mask A having an attenuating material surface) and Figure 2 (mask B having a transparent glass surface [0069]), GP is a glass plate substrate, PA is a circuit pattern area centrally located inside a pellicle frame 1g, each 1a is a (first) circuit pattern, 1b a wafer alignment mark transferred onto a semiconductor wafer, 1c a reticle alignment mark, 1d a bar code (mark for discrimination) for mask management, 1e a discrimination mark for mask discrimination, 1f a base line adjustment pattern which corrects aging of focusing and position alignment, 1h a critical dimension (CD) monitor pattern, 1i a pattern displacement monitor pattern, 1j a phase angle monitor mark of a half-tone phase shift mask, and 1k another base line adjustment pattern ([0070]). In each of Figures 1 and 2, the reticle alignment marks 1c, the bar code pattern 1d, the discrimination mark 1e, and the base line adjustment patterns 1f and 1k are all test patterns positioned on the mask outside the pellicle frame 1g (so at least these test patterns are not covered by the pellicle attached by pellicle frame 1g to the mask substrate). At least the CD monitor pattern 1h is expected to enable the mask to facilitate accurate measurement of a CD on the mask (*instant*

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claim 7). While Figures 1 and 2 show plural CD monitor patterns 1h as being positioned inside the pellicle frame 1g, it is merely a matter of design choice whether to place a CD monitor pattern inside or outside of the pellicle frame. In fact, it would have been obvious to one of ordinary skill in the art to place the CD monitor pattern outside the pellicle frame, at least because most of the other test patterns on the masks exemplified by Figures 1 and 2 are already positioned outside of the pellicle frame 1g. The methods of making such masks include steps for fabricating attenuating patterns as illustrated in Figures 3A-3B ([0072], [0075]). Generally, a binary chrome-on-glass mask can be fabricated by patterning a resist layer on a chrome (Cr) layer on a quartz glass plate or substrate and then etching the Cr layer through the resist layer ([0004], *instant claims 1 and 11*). Alternatively, the mask can be fabricated as a halftone phase shift mask (PSM, [0091]-[0092], *instant claim 12*). The first circuit pattern(s) 1a as well as the test patterns 1c, 1d, 1e, 1k (similar to 1f), 1h, 1i, and 1j are all made of the same attenuating material ([0018], [0070]) and would therefore be reasonably expected to be suitable for use under the same or similar conditions (which is another reason to suggest that CD monitor patterns 1h would be suitable for unprotected placement outside the pellicle frame 1g on the mask, just like most of the other test patterns 1c, 1d, 1e, and 1k (similar to 1f) that are placed unprotected outside the pellicle frame 1g). In the interest of shortened processing time (TAT, turn-around-time) to make patterned masks that result in reduced cost and shortened TAT for patterning semiconductor devices (including large scale integrated (LSI) circuits, [0002], [0006]) by using such patterned masks, it would have been obvious to one of ordinary skill in the art to carry out fabrication of the first circuit pattern(s) and the test patterns on the mask at the same time under the same or similar conditions. This is at least because the circuit and test patterns

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are made from the same material, presumably formed from the same layer on the mask (*instant claims 5-6*).

Claims 2-4, 8-10, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 2002/0102477) in view of Hickman (US 6,812,999) and Tu et al. (US 6,311,319).

While teaching various features of the instant claims as set forth above, Tanaka et al. do not specifically teach: *[1]* duplicating a portion of the first pattern to derive the at least one test pattern (*instant claims 2 and 8*) *[2]* that includes optical proximity correction (OPC) of the at least one test pattern by using shapes selected from serifs, hammerheads, or scattering bars (*instant claims 3-4 and 9-10*); nor *[3]* that in the method of monitoring a CD pattern on the mask, the at least one test pattern critical dimension (CD) is similar in magnitude to the first pattern CD on the mask (*instant claim 13*) and that the at least one test pattern includes patterns typical of the first pattern on the mask (*instant claims 14-15*).

Hickman teaches methods of correcting exposure defects (title). In reference to the Figure 4 flow chart, it is well known in the art that as resolution increases (on a mask or reticle), finer and more detailed measurements are needed. When desired, resolution may be selectively increased to improve accuracy of an optical correction. For fine reticle regions (e.g., having smaller CDs, etc.), the resolution of measurement may be selectively increased. The type of measurements may vary to accommodate various regions on the same reticle 130 (c5/L3, 26-31). A pellicle 140 on the mask may be designed to have corrective properties (c4/L16-19).

Tu et al. teach a minimized cost methodology involving a variety of optical proximity corrections (OPC's) for solving line end shortening and corner rounding problems (title, abstract,

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c2/L53-55). Mask OPC takes two principal forms; scatter (scattering) bars and serifs, the latter category including hammerheads. A serif is a small square that is added to the corner, or vertex, of a stripe or line on the mask. Vertices may be positive or negative, corresponding to whether they are convex or concave. A positive serif extends the boundaries of a positive vertex while a negative serif reduces the boundaries of a negative vertex. A hammerhead may be viewed as the fusion of two serifs, located on adjacent vertices (c1/L41-52, *instant claims 3-4 and 9-10*).

It would have been obvious to one of ordinary skill in the art at the time of the invention in the masks, methods of fabricating them, and monitoring or measuring of mask CD's taught by Tanaka et al. (as described above) to compensate for exposure pattern defects that would otherwise result from finer resolution mask regions having smaller CD's by utilizing a methodology involving a variety of OPC's (including e.g., serifs, hammerheads, scattering bars, etc. as taught by Hickman and Tu et al.), because this methodology minimizes cost while solving line end shortening and corner rounding optical proximity problems in the patterns, including CD's, formed from such masks (as taught by Tu et al. [2]). In order for an at least one test pattern (e.g., a CD monitor or other test pattern, etc.) to provide representative estimated CD or other test information about a first (circuit or main) pattern (e.g., CD, etc.), the at least one test pattern CD would necessarily have to be either similar in magnitude to (*instant claim 13*) and preferably derived or even duplicated from a portion of the first pattern CD (*instant claims 2 and 8, [1]*), including incorporation of applicable OPC's from the first pattern CD into the at least one test pattern CD and ensuring that the at least one test pattern includes patterns typical of the first pattern, because one of ordinary skill in the art would reasonably expect these OPC's to allow sufficient resolution and the included patterns typical of the first pattern to permit accurate

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representation or estimation of the first pattern (including the first pattern CD), during monitoring and measuring of the at least one test pattern (including the at least one test pattern CD) [3].

Response to Arguments

Applicant's arguments with respect to claims 1-15 have been considered, but they are moot in view of the new ground(s) of rejection set forth above, as necessitated by Applicant's current amendment.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

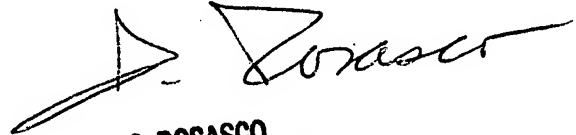
Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jsr



**S. ROSASCO
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